ASSIGNMENT 06

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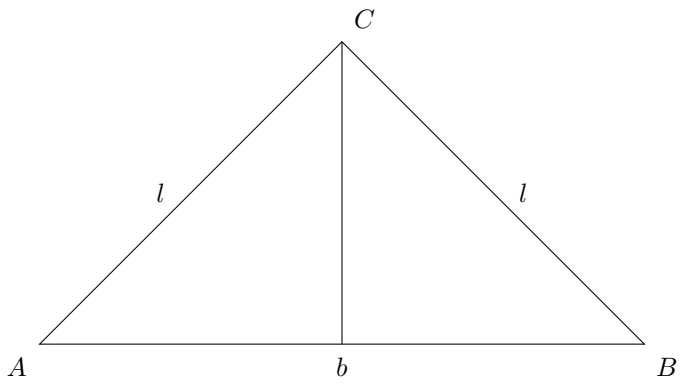
January 21, 2021

- **Question 2.67:**

  The two equal sides of an isosceles triangle with fixed base b are decreasing at the rate of 3cm per second. How fast is the area decreasing when the two equal sides are equal to the base.

  Solution:



Let the two sides of the isosceles triangle be $= l$.

$Base = b = constant(given)$

Also,the rate at which the two sides are decreasing $= dl/dt = 3cm$.

Now, By Pythagoras Theorem,

$l^2 = (b/2)^2 + p^2$

or, p= $\sqrt{l^2 - (b^2/4)}$

Now, Area of triangle = $A = 1/2(p * b)$.

or, A = $1/2(\sqrt{l^2 - b^2/4}) * b$.

or, $dA/dt = 1/2 * (b/2\sqrt{l^2 - b^2/4} * 2l(dl/dt))$.

or, $dA/dt = (1/2)bl/\sqrt{l^2 - b^2/4} * 3$. (since $dl/dt = 3cm$)

or, $dA/dt = (1/2)b^2/\sqrt{b^2 - b^2/4} * 3$. (as $l = b$)

or, $dA/dt = (3/2)b * 2/\sqrt{3}$.

or, $dA/dt = \sqrt{3} * bcm^2/s$.

- **Question 2.68:**

A tank with rectangular base and rectangular sides, open at the top is to be constructed so that its depth is 2 m and volume is $8m^3$.If building of tank costs Rs 70 per square meters for the base and Rs 4 per square meter for sides. What is the cost of least expensive tank.

Solution:

Given, volume of tank = $8m^3$.

Depth of the tank = $2m$.

Cost of building the base of tank is Rs 70/sq mtrs and Rs 4/sqr mtr for building sides.

Let x, y and z be the length, breadth and depth of the tank respectively.

Volume = $x * y * 2 = 8m^3$.

or, Volume = $2 * x * y = 8$.

or, $x * y = 4$.

Now, Curved Area of tank $= A_c = 2(2 * x + 2 * y0)$.

$A_c = 2(2 * x + 2 * y)$.

or, $A_c = 4(x + y)$.

$A_c = 4(x + 4/x)$. (since $y = 4/x$)

Hence, Total cost of Curved sides $= 4(x + 4/x) * 45 = T_c$.

or, $dT_c/dx = 4(1 - 4/x^2) * 45 = 0$.

or, $x^2 - y = 0$.

or, $x = \pm 2$.

i.e, $x = 2$.

or, $y = 2$.

Hence, total cost $= (4 * 70 + 45 * 4(2 + 2))$.

or, total cost $= (280 + 360)$.

or, total cost $= Rs640$.